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Experimental characterization of the Taylor-Couette flow submitted to a radial temperature gradient ARNAUD PRIGENT, RAPHAËL GUILLERM, INNOCENT MUTABAZI, Le Havre University, KYUNG-SOO YANG, Inha University — We have developed a non-intrusive velocity and temperature fields measurement technique using thermochromic liquid crystals which allows to fully characterize the flow produced in a narrow gap and large aspect ratio Couette-Taylor system submitted to a radial temperature gradient. The aspect ratio and radius ratio of the system are respectively equal to 112 and 0.8. The control parameters are the Grashof number Gr, related to the radial temperature gradient, and the Taylor number Ta, related to the rotation of the inner cylinder. Here, Gr is fixed and Ta is gradually increased. For small values of Ta, the base flow is composed of the circular Couette flow and a vertical flow induced by the radial temperature gradient. Above a critical value of Ta, the destabilization of the base flow gives rise to a spiral pattern. While for small Gr values it corresponds to traveling inclined vortices, for large Gr values it corresponds to a modulated wave-like pattern filling the whole length of the system and rotating at the mean angular velocity of the flow. When Ta is further increased, this wave-like pattern is progressively replaced by a counter-rotating vortices pattern. Numerical simulations of the corresponding Boussinesq-Oberbeck equations provide results in good agreement with experiments.

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